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(71) Applicant(s)
Sunrise Medical Limited
(Incorporated in the United Kingdom)
Sunrise Business Park, High Street, WOLLASTON,
West Midlands, DY8 4PS, United Kingdom

(72) Inventor(s)
Peter James Tasker
Robert Alan Menear

(74) Agent and/or Address for Service
Forrester Ketley & Co
Chamberlain House, Paradise Place, BIRMINGHAM,
B3 3HP, United Kingdom

(54) Abstract Title
A stairlift assembly

(57) A battery powered stairlift carriage 12 is arranged to move automatically to a battery charging position 18 in the event that the carriage is brought to rest in a non-charging position. The track may include a retractable bottom end extension 44 (figures 5 and 6, not shown), and the battery may be recharged whilst situated on the extension or control means may be provided to move the carriage to a charging position situated above the extension and to then retract the extension to prevent the stairlift forming an obstruction adjacent it's lower end. The control means may also be arranged to lift/lower the carriage seat as appropriate. The carriage may also include electronic braking circuitry to slow the carriage as it approaches a predetermined point, the position of the carriage along the track being monitored by means of microswitches or magnets along the track, the latter cooperating with a reed switch on the carriage. The carriage carries a drive pinion engaging downwardly facing teeth of a rack forming part of the track, the pinion lying in a plane 7.5 degrees off the vertical (figures 8 and 9, not shown).The track may comprise two sections connected by a connection bar (57) engaging cavities with converging walls in each section (figure 7, not shown).

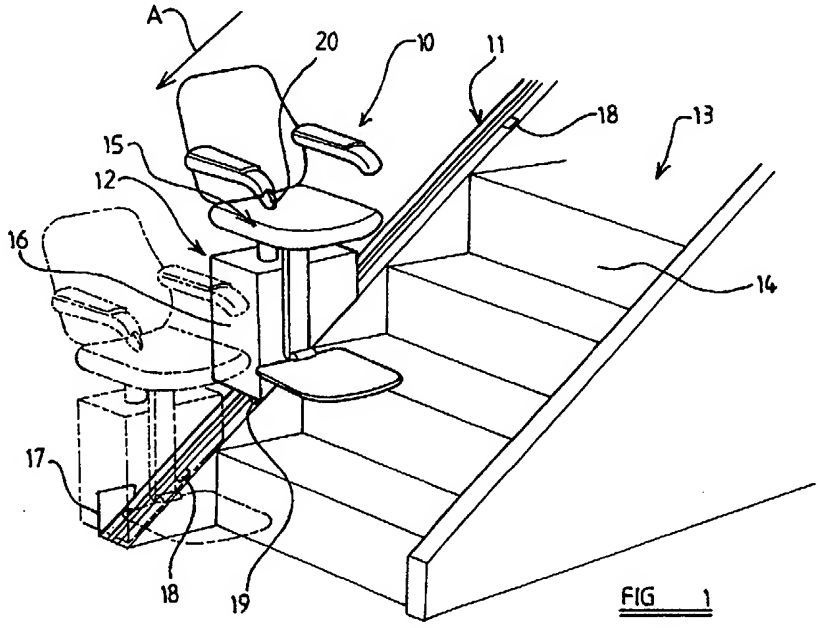

FIG 1

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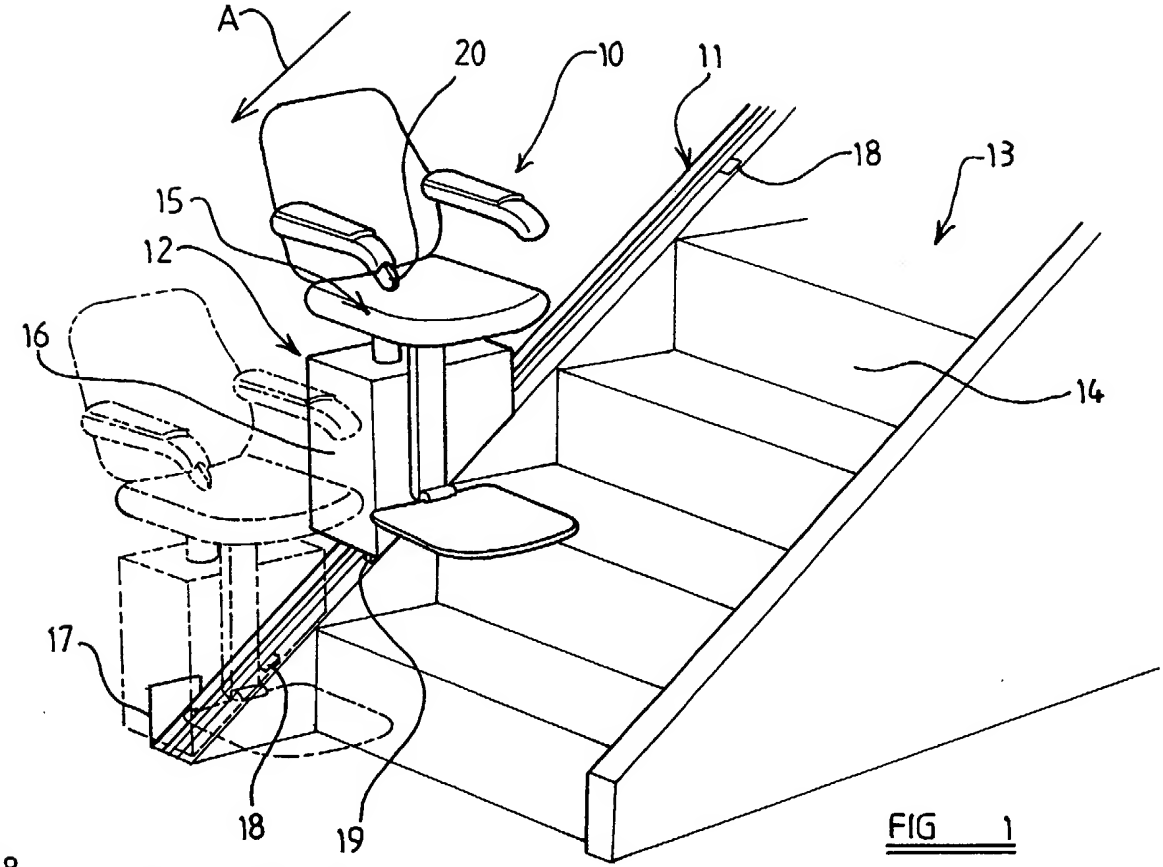
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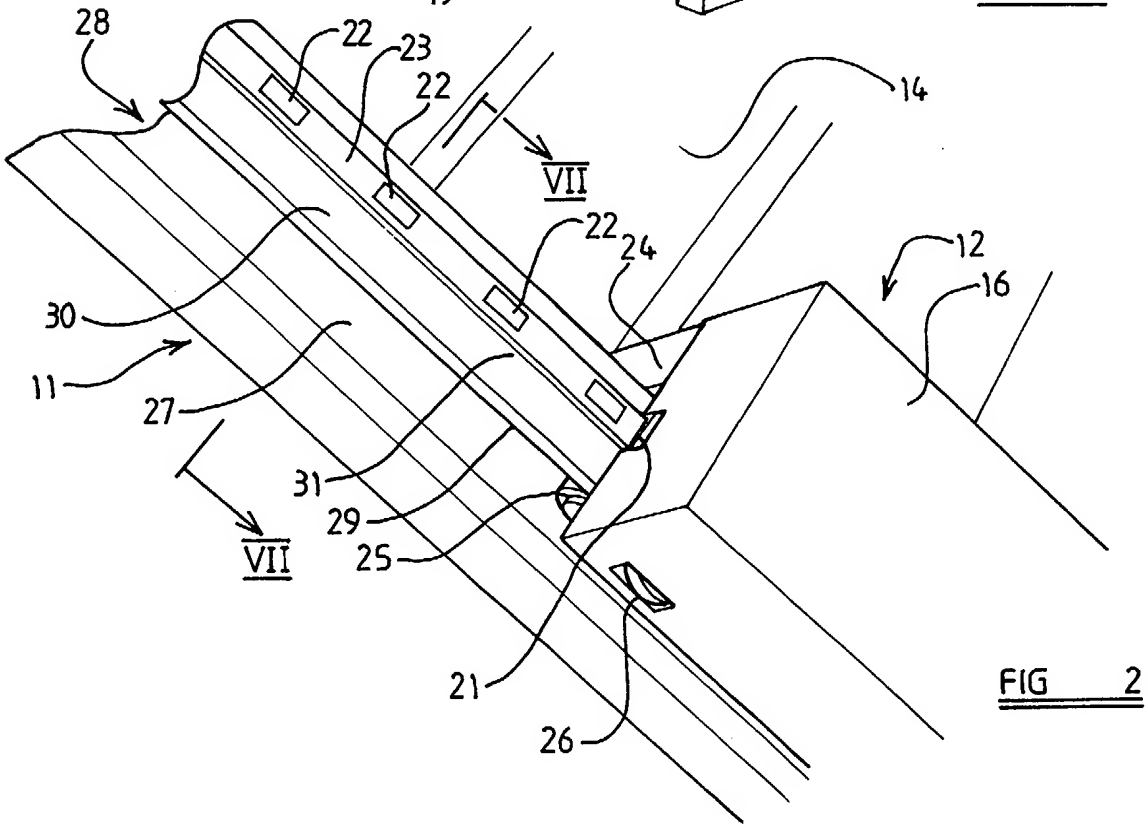
FIG 1


28
22
23
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VII
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FIG 2

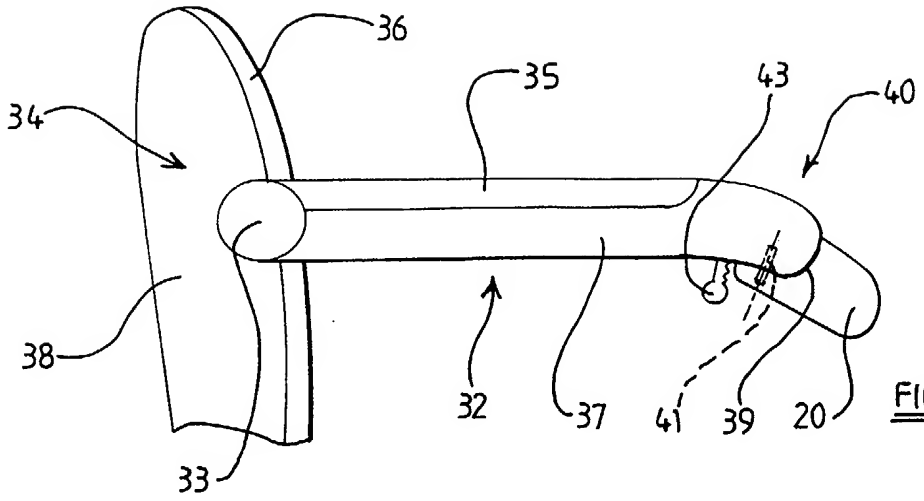

FIG 3

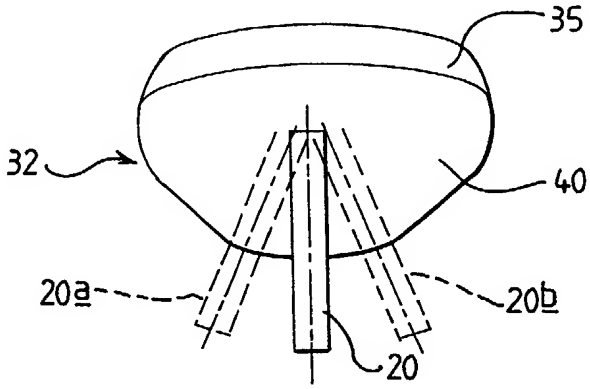

FIG 4

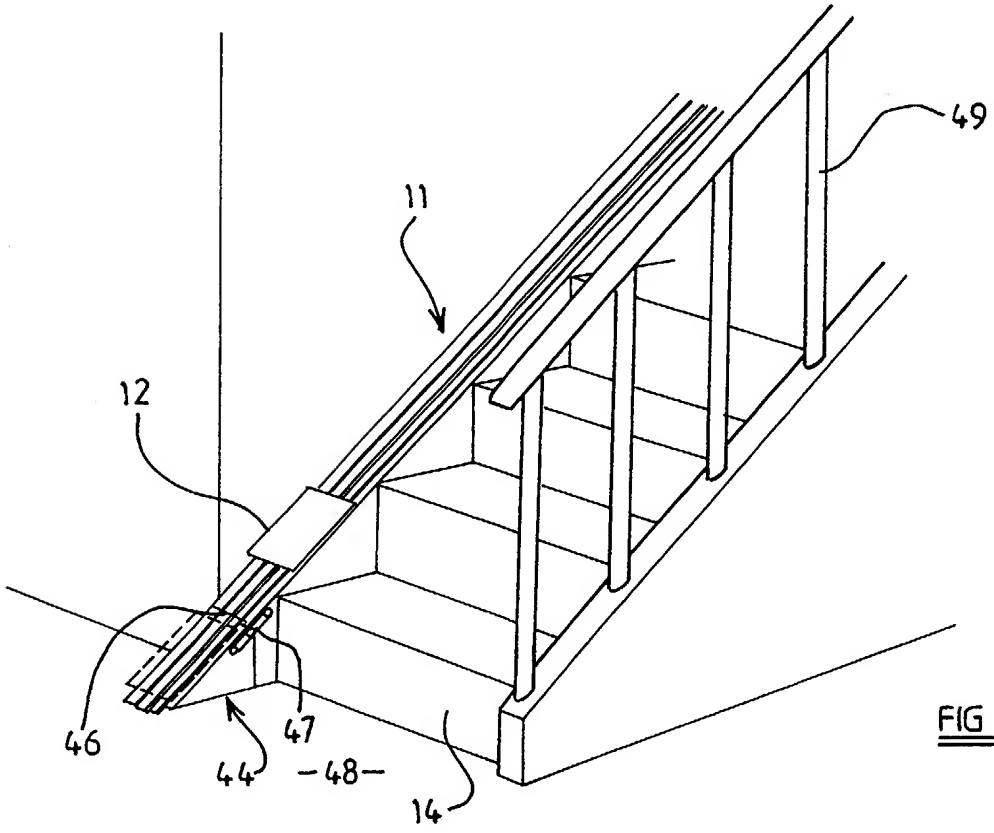

FIG 5

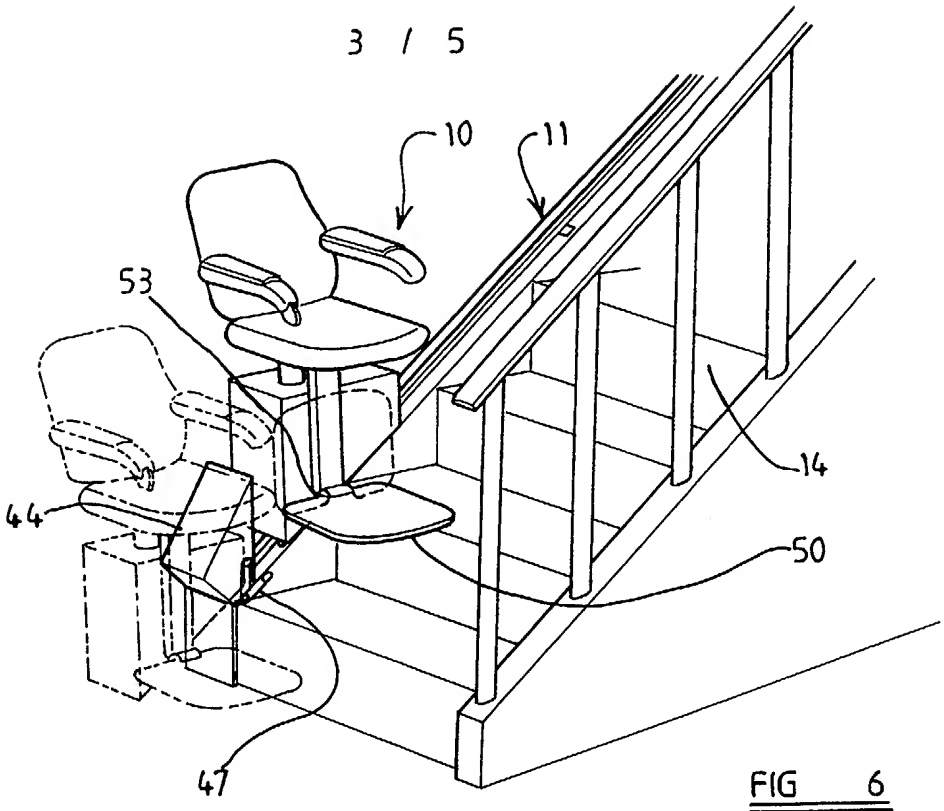

FIG 6

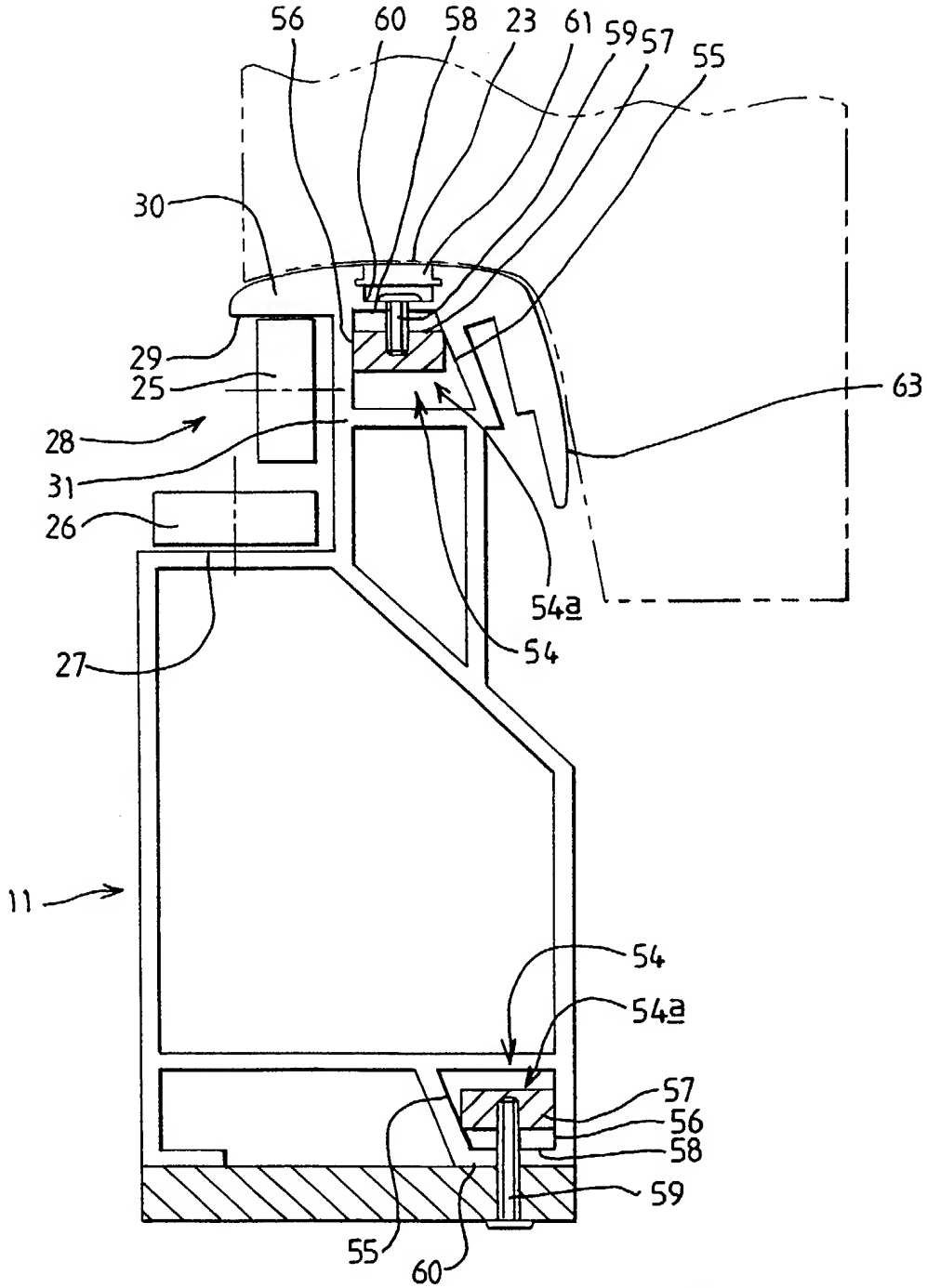
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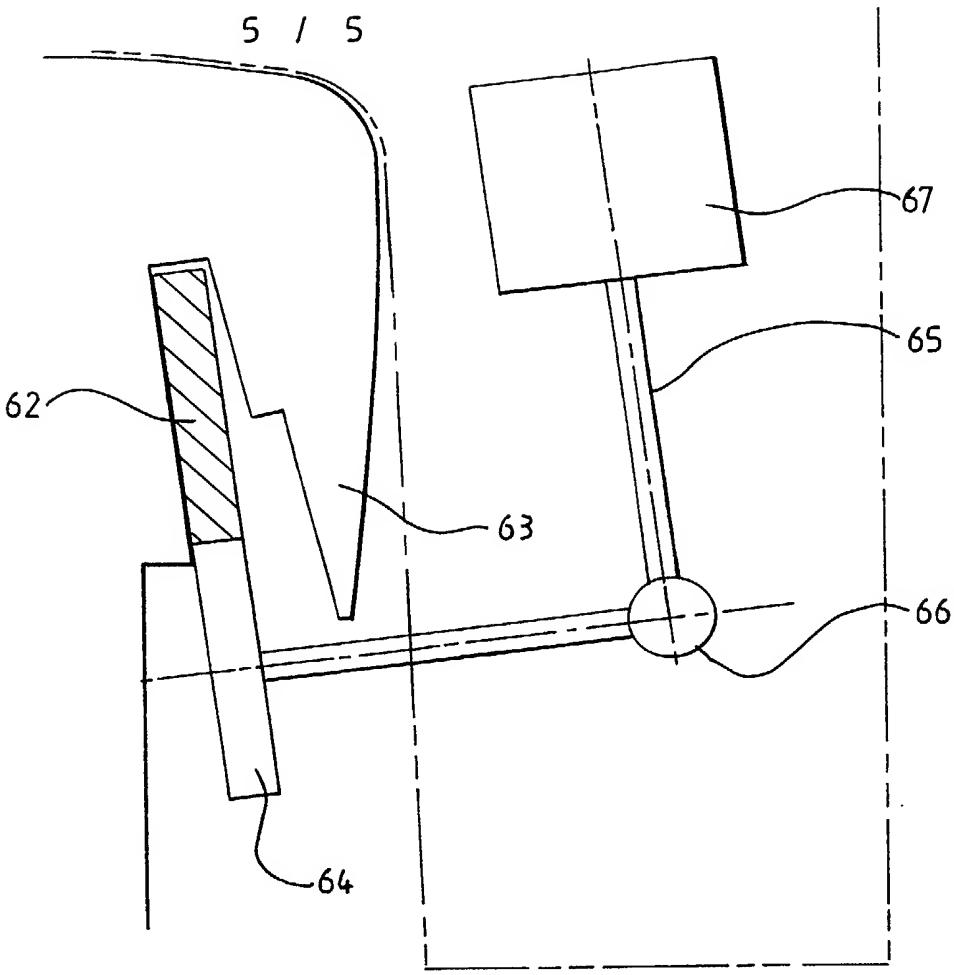
FIG 7

FIG 8



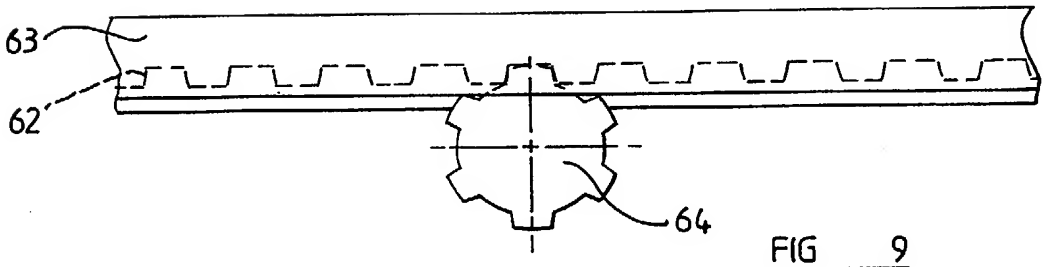


FIG 9

Title: A Stairlift Assembly

Description of Invention

This invention relates to a stairlift assembly of the type which is used, for example, by the elderly or infirm to assist them in negotiating a flight of stairs. Stairlift assemblies of this type typically comprise a track which is mounted on or secured to one side of the stairs, and a carriage which is moveable relative to the track, with the carriage supporting a seat on which the user is positioned when the assembly is in use.

To ensure that users are not prevented from climbing or descending the stairs in the event of a mains electrical power failure, stairlift assemblies of this type are usually powered by one or more rechargeable batteries, typically located within or closely adjacent the carriage, with charging power being supplied to the batteries from a set of contacts disposed on or closely adjacent the track. So as to minimise the possibility of the carriage being left at a position along the track at which charging of the batteries cannot occur, a number of currently available stairlifts are provided with warning signal generators which are operative to generate an audible and/or visual warning signal in the event that the carriage is left at such a non-charging position.

However, in some environments, and in particular where the user is hard-of-hearing or visually impaired, these warnings can go unheeded, meaning that there is a risk that the assembly will not function satisfactorily - or at all - when the user next tries to operate it.

It is thus an object of the present invention to provide a stairlift assembly which overcomes or at least reduces this problem.

According to a first aspect of the present invention, there is provided a stairlift assembly having a track and a carriage which is moveable relative to the track, the carriage having a charging position at which electrical power is

supplied to the carriage, control means being provided automatically to move the carriage to the charging position in the event that the carriage is brought to rest at a different position.

In this way, should a user of the assembly inadvertently leave the carriage at a position on the track at which the batteries in the carriage cannot be recharged, the control means will operate to move the carriage along the track to the charging position, thus ensuring that the batteries are at least partially recharged prior to subsequent use of the assembly.

The control means may be operative to move the carriage to the charging position in the same direction as that in which it was moving prior to it being brought to rest. Thus, the control means may be operative to determine, conveniently by virtue of a link to the motor by which the carriage is moved, the direction in which the carriage was moving prior to it being brought to rest.

Where the carriage has a charging position at or adjacent both ends of the track, the control means may be operative to ensure that the carriage is caused to move to the most appropriate charging position, taking into account the previous direction of movement of the carriage.

The carriage may comprise magnetic sensing means whereby the control means is able to determine the position of the carriage relative to the charging position. The sensing means may comprise a reed switch, and the track may be provided with a plurality of magnets arranged along the track, which bias the reed into a sensing condition.

The control means may also determine the position of the carriage relative to an end of the track.

The carriage may be provided with a pick-up by which the electrical power is supplied to the carriage, with the control means being operative to move the carriage to the charging position only in the absence of a flow of current in the pick-up.

The control means may be operative to move the carriage to the charging position only after a predetermined time interval. The time interval may conveniently be about one minute. During the time interval, the control means may be operative to generate an audible or visual warning signal to indicate to a user of the stairlift assembly that the carriage has been brought to rest at a position other than the charging position.

Movement of the carriage relative to the track may be effected by a user of the stairlift assembly engaging a switch, with a timing arrangement being operatively associated with the switch whereby movement of the carriage commences only after a predetermined delay, during which delay the switch must remain engaged by the user.

With such a timing arrangement, inadvertent movement of the carriage, which could be caused by accidental, brief, engagement of the switch, can be avoided. The delay may be selected by the user, but conveniently is between about one second and about three seconds.

To improve the user's comfort when the assembly is in operation, the assembly may comprise a brake which is operative gradually to slow movement of the carriage as it approaches a predetermined position. The brake may be operative gradually to reduce the electrical power supplied to a motor which moves the carriage relative to the track. Conveniently, the brake may be operatively associated with the sensing means whereby movement of the carriage is slowed upon the carriage reaching a predetermined position, as detected by the sensing means.

In accordance with a second aspect of the present invention, there is provided a stairlift assembly having a track and a carriage which is moveable relative to the track, a brake being provided which is operative gradually to slow movement of the carriage as it approaches a predetermined position.

The brake may be operative gradually to reduce the electrical power supplied to a motor which moves the carriage relative to the track. The brake

may be operatively associated with sensing means provided on the carriage whereby movement of the carriage is slowed upon the carriage reaching a predetermined position, as determined by the sensing means.

The invention, insofar as it is in accordance with the second aspect as above defined, may further comprise one or more of the features described in relation to the first aspect.

In some environments, particularly where it is important that the user is conveyed all the way to the bottom of the stairs, such that no step need be negotiated as the user moves from the stairlift to a wheelchair, for example, it is important that the track should extend fully (or very nearly) to the floor adjacent the lowermost stair. However, when the assembly is not in use, this can be inconvenient, as the track juts out from the stairs, and thus presents a tripping hazard to other people, who may also have mobility and/or sight problems. To alleviate this, a lowermost part of the track (henceforth referred to as an "extension part") may be moveable, conveniently hingedly, from an operative position, in which movement of the carriage to the bottom of the stairs is permitted, to an inoperative position, in which the movement is not so permitted. In addition, so that the batteries provided in the carriage may be recharged when the extension part is in its inoperative position, it is known to provide on (or closely adjacent) the track, an additional charging position at which electrical power may be supplied to the carriage, and it is a further object of the present invention to provide an improved stairlift assembly of this general type.

Thus, according to a third aspect of the present invention, there is provided a stairlift assembly having a track and a carriage which is moveable relative to the track, the track having at one end thereof an extension part which is moveable between operative and inoperative positions, the carriage having a charging position between the extension part and the other end of the track, at which position electrical power is supplied to the carriage, control means being

provided whereby the carriage may be caused to move from the extension part to its charging position, the control means also being operative subsequently to move the extension part to its inoperative position.

The control means may conveniently be operated remotely, for example by an infra-red transmitter. Alternatively, a switch or similar actuator may be provided on the track, the carriage, or nearby banisters.

The control means may also be operative to move or to allow to move a footplate of the carriage from an operative to a stowed position. Conveniently, the footplate is so moved before the carriage is caused to move towards its charging position.

The invention, in its third aspect, may comprise one or more of the features previously described in relation to the first and/or second aspects.

A further problem which can arise during installation of a stairlift assembly at a person's home occurs where the length of the staircase - and hence the required length of track - is too great to allow a one-piece track construction to be manipulated within the premises concerned, without difficulty.

In such environments, it is therefore necessary to use a track formed from several (usually two) separate sections, with the sections being connected together in end-to-end relationship so as to provide the required overall length.

So that the carriage may move freely relative to the track, and in particular over the region at which the sections are connected together, it is imperative that relative displacement of those ends of the sections which are connected together be kept to a minimum, and it is thus a further object of the present invention to provide an improved stairlift assembly of this kind.

According to a fourth aspect of the present invention, there is provided a stairlift assembly having a track and a carriage which is moveable relative to the track, the track comprising two sections which are connected together in end-to-end relationship, a connecting member extending between the sections,

the sections each having a constraining formation having converging parts defining a narrowing space therebetween, part of the connecting member being located within a constraining formation and being urged towards a relatively narrow part of the space.

Each said section of the track may be a extrusion, with the associated constraining formation comprising a passage or channel, the passage or channel having converging side walls.

The connecting member may be urged towards the relatively narrow part of the space by a screw-threaded fastener extending through the section into the constraining formation and into the connecting member.

The head of the screw-threaded fastener may be received within a recess of the section, and a cover may be provided to shield the head from view and/or to prevent unauthorised access thereto. The recess may comprise an elongate channel, and the cover may comprise a strip, with the channel and strip being mutually configured so that the strip may be held securely within the channel.

The invention, in its fourth aspect, may comprise one or more of the features described in relation to the first, second and third aspects.

In accordance with a fifth aspect of the present invention, there is provided a method of connecting together two sections of extruded material, the sections each having a constraining formation having converging parts, the converging parts defining a narrowing space therebetween, the method comprising locating a connecting member within the constraining formation of each section, the connecting member extending between the sections, and urging the connecting member towards a relatively narrow part of the space.

Whilst a variety of devices and constructions are known by which the carriage engages the track, a common system currently in use employs a rack and pinion arrangement, with the rack being associated with the track, and with the pinion being operatively associated with the moveable carriage. Such arrangements in general perform quite satisfactorily, although in view of the

orientation of the rack relative to the stairs, the teeth of the rack are often exposed, and can become clogged with foreign matter such as fluff and dirt which can collect easily on carpeted stairs, for example. Accordingly, it is a still further object of the present invention to provide a stairlift assembly which does not suffer from, or which suffers less from, this problem.

Thus, in accordance with a sixth aspect of the present invention, there is provided a stairlift assembly having a track and a carriage which is moveable relative to the track, the carriage engaging the track via a rack and pinion arrangement, the teeth of the rack extending generally towards the stairs on which the assembly is mounted.

The pinion, mounted on the carriage, may lie in a plane which is substantially vertical. Preferably, however, the pinion lies in a plane which is offset from the vertical by about 5-10°. Conveniently, the plane is offset from the vertical by about 7.5°.

The rack may be protected by a lip of the track, with the lip, over a substantial part of its length, extending further towards the stairs than the teeth of the rack.

The invention, in its sixth aspect, may comprise one or more of the features described in relation to the first, second, third, fourth or fifth aspects.

The invention will now be described in greater detail, but by way of example only, by reference to the accompanying drawings, wherein:

Figure 1 is a perspective view of a stairlift assembly;

Figure 2 shows a detail of Figure 1 - in particular, the engagement of the stairlift carriage with the track;

Figure 3 is a side view of an arm of a stairlift seat;

Figure 4 is an end-on view of the toggle switch shown in Figure 3;

Figure 5 is a somewhat schematic view of a stairlift assembly having a track with a hinged extension part;

Figure 6 is a more general view of the arrangement shown in Figure 5;

Figure 7 is a sectional view of the track, taken along the line VII-VII of Figure 2,

Figure 8 shows a rack and pinion arrangement, in end-on view; and

Figure 9 shows a side view of the arrangement shown in Figure 8.

Referring first to Figure 1, there is shown a stairlift assembly generally indicated at 10 having a track 11 and a carriage 12 which is engaged with the track 11 for sliding movement relative thereto. The assembly is mounted on a staircase 13, such that an elderly or infirm person, for example, may negotiate the stairs 14 by sitting on a seat 15 which is mounted on the carriage 12. The carriage 12 engages the track 11 by virtue of a rack and pinion arrangement (see Figures 8 and 9) with the rack being provided on the track 11, and with the pinion being provided on or within the carriage 12. The pinion is caused to rotate by an electric motor (not shown) housed within a motor housing 16, with the motor being powered by electricity supplied by one or more rechargeable batteries (also not shown) also contained within the motor housing 16. As is conventional, mains electrical power is supplied to the assembly via a step-down transformer 17 positioned towards the bottom of the track 11, with direct current (D.C.) thus being supplied to electrical contacts 18, which, in the example shown, are located towards opposite ends of the track 11. The carriage 12 is provided with a mutually configured contact generally indicated at 19, whereby direct current from the contacts 18 is supplied to the rechargeable batteries located within the motor housing 16.

During normal use of the stairlift, the motor is driven by electrical power supplied from the batteries, with the capacity of the batteries typically being such that ten to twenty ascents and descents may be achieved without recharging of the batteries being required. However, so that the assembly is always ready for use, with the batteries being charged to a satisfactory level, the carriage 12, when not in use, may be "parked" at a charging position, at

which charging position the contacts 18 and 19 come into engagement, thus supplying electrical power to the batteries contained within the housing 16 of the carriage 12.

To guard against the possibility of the carriage 12 being left at a position other than the charging position, the assembly is provided with control means in the form of electronic circuitry contained within the motor housing 16 which, after a predetermined delay of about one minute, is operative to cause the carriage 12 to move to the charging position, represented in dotted outline in Figure 1. During the delay, the control means is also operative to generate an audible and/or visual warning signal, alerting the user to the fact that the carriage has been brought to rest at a position at which charging cannot occur, so that the user, if desired, may manually effect movement of the carriage towards the charging position.

To ensure that the carriage 12 is positioned at the correct end of the track 11 for subsequent use, the control means is also operative to ensure that the carriage moves to the charging position in the same direction as that in which it was moving prior to it being brought to rest. Thus, referring to Figure 1, if a user, seated on the carriage 12, effects movement of the carriage down the stairs (in the general direction of the arrow A) but, perhaps by accidental release of a toggle switch 20, stops short of the charging position, the control means will operate, after a delay of about one minute, to continue movement of the carriage 12 in the direction A towards the charging position. Similarly, if the assembly were being used in an ascending manner, the control means would be operative to continue with movement towards the upper contacts 18 so that charging would be effected at the upper charging position, ready for a subsequent descent.

To enable the position of the carriage 12 relative to the track 11 to be determined, and to enable the direction of movement of the carriage 12 to be determined, the carriage 12 is provided with magnetic sensing means in the

form of a reed switch 21, with the track 11 being provided with a plurality of magnets 22 which, in Figure 2, are positioned along the track 11 at approximately equidistant intervals. The magnets 22 are concealed from view by a removable plastics cover strip 23, and the magnetic interaction between the reed of the reed switch 21 and the succession of magnets 22 enables the electronic control means housed within the motor housing 16 to determine both the position and the direction of travel of the carriage 12. It will however be appreciated that other sensing means could conceivably be provided, conceivably of the type comprising micro-switches or the like, in which physical (i.e. actual) contact is made between the switches and the carriage 12.

The pinion by which the carriage 12 is moved relative to the track 11 is mounted on an arm 24 of the carriage, with the carriage being held in position relative to the track 11 by a set of rollers, two of which are shown at 25 and 26. The upper roller 25 is positioned between, and bears upon, a lower part 27 of a running channel 28, and a lower face 29 of a retaining lip 30 of the extruded track 11. The lower roller 26, which runs about an axis which is perpendicular to the axis of rotation of the roller 25, is also partly disposed beneath the retaining lip 30, but bears upon an upstanding part 31, which is approximately perpendicular to the lip 30. Figure 7 (a cross-section along the lines VII-VII) shows this in more detail.

Referring next to Figure 3, this shows, in side view, one arm 32 of the seat 15, the arm 32 being pivotable relative to the back 34 of the seat 15 about an axis 33. Part of the uppermost surface of the arm 32 is provided with a removable cushion 35, the cushion 35, as with a back cushion 36, being releasably attached to the plastics arm and back parts 37 and 38 by a number of hook and loop fasteners (not shown) to enable removal of the cushions for cleaning, for example.

The toggle switch 20, which has a cut-away part 39, is mounted for pivotal movement relative to a front part 40 of the arm 32 and is held in

position by a pivot pin 41 which extends into a correspondingly configured bore 42 in the front part 40. The toggle switch 20 is electrically connected to the motor, such that movement of the switch effects sliding movement of the carriage 12 relative to the track 11. To prevent unauthorised use of the assembly, a key 42 may be provided, in generally conventional manner.

It can be seen from Figure 3 that the switch 20 lies well below the upper surface of the arm 32, meaning that inadvertent engagement of the switch 20 by a user is avoided, in contrast with previous constructions, which have a switch positioned on or near an upper surface of the front part 40.

As shown in Figure 4, the switch 20, which is considerably thinner than the front part 40 of the arm 32 to which it is pivotally mounted, may toggle between positions 20a and 20b, corresponding respectively to descending and ascending movement of the carriage 12. The switch is operatively associated with a timing arrangement such as an electronic timing circuit, which allows movement of the carriage to commence only after a predetermined delay of between one and three seconds, during which delay the switch must remain engaged by the user, if movement of the carriage is to commence.

Electronic brake circuitry is contained within the motor housing 16, the brake being operative gradually to slow movement of the carriage 12 as it approaches a predetermined position, such as an end of the track 11. As previously described, the position and the direction of travel of the carriage 12 relative to the track 11 may be determined by electronic control means linked to a succession of magnets 22 and a reed switch 21, and the electronic brake circuitry may therefore be effective to operate once the electronic control means has determined that a particular, predetermined, position of the carriage 12 has been arrived at. The brake may act directly on a part of the carriage such as a pinion 64 (see Figures 8 and 9) such that rotation of the pinion is slowed by frictional forces exerted thereupon by the brake. Alternatively, the brake could be caused to act upon a bearing surface of the track 11. In a

preferred embodiment, however, the brake is operative gradually to reduce the electrical power supplied to a motor which moves the carriage 12 relative to the track 11, meaning that subsequent to release of the switch 20 by the user of the stairlift, movement (either ascending or descending) of the carriage 12 is slowed gradually until the carriage 12 is brought completely to rest, making use of the stairlift more comfortable for the user.

Referring next to Figure 5, this shows a stairlift assembly of the type in which the track 11 is provided with an extension part 44, the extension part 44 being hingedly attached to the main part 45 by a hinge 46, a linkage 47 being provided to retract the extension part 44 from the operative position shown in solid outline in Figure 5 to the inoperative (stowed) position shown in dotted outline. When the assembly is being used to descend the stairs 14, the extension part 44 is moved to its operative position, so that the carriage 12 (shown schematically in Figure 5) may descend fully to the bottom of the track 11, so that a user of the assembly may alight directly onto the floor 48, without the necessity to negotiate any of the stairs 14.

Subsequent to the descent, however, the extension part 44 - and indeed the carriage 12 and the seat 15 - constitute an unwanted obstruction at the bottom of the stairs 14, which can present a tripping hazard to other people who may be frail or partially sighted, for example.

The control means provided on the carriage 12 is thus configured to cause the carriage 12 to move from the extension part 44 to a charging position between the extension part 44 and an upper end of the track 11, the control means also being operative subsequently to move the extension part 44 to its inoperative position.

The control means may be operated remotely by an infra-red transmitter, such that a user, having alighted from the seat 15 at a lower end of the extension part 44, need only operate a button on the transmitter for the carriage to be moved to its charging position (shown in solid outline in Figure 5) from

its previous, obstructing, position, shown in dotted outline in Figure 5. As the control means of the assembly, which may be provided by electronic circuitry well within the scope of expertise of those skilled in the relevant art, is also operative subsequently to retract the extension part 44 to its inoperative position, not only are the batteries within the carriage 12 able to be recharged, but the obstruction presented by the carriage 12 and the extension part 44 is also removed, in an automatic manner.

The movement of the extension part 44 between its operative and inoperative positions in this example is effected by the action of a piston and cylinder arrangement. Alternatively, a chain link could be used, whereby the extension part 44 is moved to and from its stowed position in a "drawbridge"-type manner.

Alternatively, the control means may be operated by a switch positioned, for example, on one of the banisters 49, and there may also be provided an alternative charging position on the extension part 44. In this way, if the carriage/seat and the extension part 44 are not considered to present a sufficient hazard, the batteries within the carriage 12 may be recharged whilst the carriage is in position on the extension part 44.

Referring next to Figure 6, which shows a somewhat wider view of the arrangement shown in Figure 5, it can be seen that in addition to retraction of the extension part 44, a footplate 50 is also moved by the control means from an operative position (shown in solid outline) to a stowed position (shown in dotted outline) in which it is generally vertically orientated. The footplate may be moved towards its stowed position by a piston mounted on the carriage 12, the piston bearing upon an ear or lug which is attached to or integral with a side edge 53 of the footplate 50. Alternatively, the footplate 50 may be spring-biased towards its stowed position, and the control means may thus be operative to allow the footplate to move towards the stowed position by removal of a barrier which acts against the force of the spring.

Referring next to Figure 7, this shows a sectional view of the track 11, taken along the section VII-VII of Figure 2, with the corresponding parts being numbered accordingly. More particularly, however, Figure 7 shows how two sections of the track 11, which are typically formed from profiles of extruded aluminium, are connected together in end-to-end relationship when the total length of the track requires more than one distinct length of the extruded material to be used.

As shown in Figure 7, the section of the track 11 has a pair of constraining formations in the form of passages 54, the passages 54 having a sloping side wall 55 which, together with the generally upright opposing side wall 56, define spaces 54a therebetween, which narrow towards the top and the bottom respectively of the section 11.

To connect together two sections of the track 11 in end-to-end relationship, a connecting member in the form of a mild steel bar 57 is positioned within each of the upper and lower passages 54, with the bars 57 extending across the joint between the opposing ends of each section of the track 11. The cross-sectional area of the bars 57 is such that the bars may be received freely within the relatively wide part of the spaces defined by the walls 55 and 56 of the passages, but such that it cannot pass into the narrowest parts of the spaces indicated generally at 58. Once the bars 57 have been positioned within the passages 54, a screw or similar fastener 59 is passed through each of two externally accessible surfaces 60, with continued tightening of the screws 59 drawing the bars 57 towards the narrow parts 58 of the spaces defined by the walls 55 and 56. As this movement continues, the bars 57 becomes progressively more "jammed" within the narrowing spaces, meaning that the positions of each section of the track 11 relative to the common bars 57 are kept constant. In this way, a very close and secure join may be obtained between the two sections, with any vertical offset between

them being kept to an absolute minimum, as of course is required if a smooth passage of the carriage 12 over the join is to be achieved.

Subsequent to the introduction and tightening of the screws 59, a plastics cover strip 23 may be introduced within an upper channel 61 of the track 11, with the cover strip 23 serving not only to conceal the heads of the screws 59 from view, but also to provide an aesthetically pleasing "stripe" along the exposed upper surface of the track 11. As shown in Figure 2, the upper channel 61 also serves to house - and conceal - the plurality of magnets 22 which enable the position and direction of movement of the carriage to be determined.

Referring finally to Figures 8 and 9, these show end-on and side views respectively of a rack and pinion arrangement by which the carriage 12 is moved relative to the track 11. As shown in Figure 8, the teeth 62 of the rack adopt a near-vertical orientation, with a particularly convenient orientation having been found to be about 7.5° off the vertical, towards the track 11. Orientating the teeth in this near-vertical way reduces considerably the amount of foreign matter such as dust and fluff which could otherwise congregate between successive teeth, and also enables the rack to be protected by an overhanging lip 63, as shown additionally in Figure 7. This protective lip restricts damage which might otherwise occur to the teeth 62, and also provides an aesthetically pleasing appearance, as the teeth are not visible from above the track 11. To engage with the approximately vertically orientated teeth 62, the carriage 12 is linked to a pinion 64, rotation of the pinion 64 by an electric motor causing sliding movement of the carriage 12 along the track 11, in generally conventional manner. The pinion 64 may be driven by a drive shaft 65, rotation of the drive shaft 65 about a near-vertical axis being converted to rotation of the pinion 64 about a near-horizontal axis by a bevel gear assembly illustrated schematically at 66. As shown especially in Figure 8, the 7.5° offset of the teeth 62, the pinion 64, and the drive shaft 65, enables the bulk of the

motor (illustrated very schematically at 67) to be positioned as near as possible to the track 11, meaning that the space defined between the track 11 and the banisters 49 (see Figure 6) may be kept to a maximum.

The invention previously described, in its various aspects, provides a stairlift assembly having many advantages over currently available systems, in terms of safety, comfort, and ease of use. Although the specification inevitably describes the various features separately, it will be appreciated by those skilled in the art that one or more of the features previously described could be combined in various ways, giving rise to a variety of stairlift assemblies having a selection of some of these features.

In the present specification "comprise" means "includes or consists of" and "comprising" means "including or consisting of".

The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately, or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

CLAIMS:

1. A stairlift assembly having a track and a carriage which is moveable relative to the track, the carriage having a charging position at which electrical power is supplied to the carriage, control means being provided automatically to move the carriage to the charging position in the event that the carriage is brought to rest at a different position.

2. An assembly according to claim 1 wherein the control means is operative to move the carriage to the charging position in the same direction as that in which it was moving prior to it being brought to rest.

3. An assembly according to claim 1 or claim 2 wherein the carriage is provided with magnetic sensing means whereby the control means determines the position of the carriage relative to the charging position.

4. An assembly according to claim 3 wherein the sensing means comprises a reed switch, and wherein the track is provided with a plurality of magnets arranged along the track which bias the reed into a sensing condition.

5. An assembly according to claim 3 or claim 4 wherein the control means also determines the position of the carriage relative to an end of the track.

6. An assembly according to any one of the preceding claims wherein the carriage is provided with a pick-up by which the electrical power is supplied to the carriage, the control means being operative to move the carriage to the charging position only in the absence of a flow of current in the pick-up.

7. An assembly according to any one of the preceding claims wherein the control means is operative to move the carriage to the charging position only after a predetermined time interval.

8. An assembly according to claim 7 wherein the time interval is about one minute.

9. An assembly according to any one of the preceding claims wherein the control means is operative to generate an audible or visual warning signal to indicate to a user of the stairlift assembly that the carriage has been brought to rest at a position other than the charging position.

10. An assembly according to any one of the preceding claims wherein movement of the carriage relative to the track is effected by a user of the stairlift engaging a switch, a timing arrangement being operatively associated with the switch whereby movement of the carriage commences only after a predetermined delay, during which delay the switch must remain engaged by the user.

11. An assembly according to claim 10 wherein the delay is between about one second and about three seconds.

12. An assembly according to any one of the preceding claims comprising a brake which is operative gradually to slow movement of the carriage as it approaches a predetermined position.

13. An assembly according to claim 12 wherein the brake is operative gradually to reduce the electrical power supplied to a motor which moves the carriage relative to the track.

14. An assembly according to claim 12 or claim 13, when dependent on any one of claims 3 to 11, wherein the brake is operatively associated with the sensing means whereby movement of the carriage is slowed upon the carriage reaching a predetermined position.

15. A stairlift assembly having a track and a carriage which is moveable relative to the track, a brake being provided which is operative gradually to slow movement of the carriage as it approaches a predetermined position.

16. An assembly according to claim 15 wherein the brake is operative gradually to reduce the electrical power supplied to a motor which moves the carriage relative to the track.

17. An assembly according to claim 15 or claim 16 wherein the brake is operatively associated with sensing means provided on the carriage whereby movement of the carriage is slowed upon the carriage reaching a predetermined position.

18. An assembly according to claim 15, claim 16 or claim 17 further comprising one or more of the features set out in claims 1 to 11.

19. A stairlift assembly having a track and a carriage which is moveable relative to the track, the track having at one end thereof an extension part which is moveable between operative and inoperative positions, the carriage having a charging position between the extension part and the other end of the track, at

which position electrical power is supplied to the carriage, control means being provided whereby the carriage may be caused to move from the extension part to its charging position, the control means also being operative subsequently to move the extension part to its inoperative position.

20. An assembly according to claim 19 wherein the control means is operated remotely, for example by an infra-red transmitter.

21. An assembly according to claim 19 or claim 20 wherein the control means is also operative to move or to allow to move a footplate of the carriage from an operative to a stowed position.

22. An assembly according to claim 21 wherein the footplate is so moved before the carriage is caused to move towards its charging position.

23. An assembly according to any one of claims 19 to 22, further comprising one or more of the features set out in claims 1 to 18.

24. A stairlift assembly having a track and a carriage which is moveable relative to the track, the track comprising two sections which are connected together in end-to-end relationship, a connecting member extending between the sections, the sections each having a constraining formation having converging parts defining a narrowing space therebetween, part of the connecting member being located within a constraining formation and being urged towards a relatively narrow part of the space.

25. An assembly according to claim 24 wherein each section is an extrusion, with the associated constraining formation comprising a channel or passage, the channel or passage having converging side walls.

26. An assembly according to claim 24 or claim 25 wherein the connecting member is urged towards the relatively narrow part of the space by a screw-threaded fastener extending through the section into the constraining formation and into the connecting member.

27. A stairlift assembly according to claim 24, claim 25 or claim 26 further comprising one or more of the features set out in claims 1 to 23.

28. A method of connecting together two sections of extruded material, the sections each having a constraining formation having converging parts, the converging parts defining a narrowing space therebetween, the method comprising locating a connecting member within the constraining formation of each section, the connecting member extending between the sections, and urging the connecting member towards a relatively narrow part of the space.

29. A method according to claim 28 wherein the constraining formation comprises a channel or passage having converging side walls, and wherein the connecting member is urged towards the relatively narrow part of the space by a screw-threaded fastener extending through the section into the channel or passage, and into the connecting member.

30. A stairlift assembly having a track and a carriage which is moveable relative to the track, the carriage engaging the track via a rack and pinion arrangement, the teeth of the rack extending generally towards the stairs on which the assembly is mounted.

31. An assembly according to claim 30 wherein the pinion, mounted on the carriage, lies in a plane which is substantially vertical.

32 An assembly according to claim 30 or claim 31 wherein the pinion, mounted on the carriage, lies in a plane which is about 7.5° off the vertical.

33. An assembly according to claim 30, claim 31 or claim 32 wherein the rack is protected by a lip of the track, the lip, over a substantial part of its length, extending further towards the stairs than the teeth of the rack.

34. An assembly according to claim 30, claim 31, claim 32 or claim 33, further comprising one or more of the features set out in claims 1 to 29.

35. A stairlift assembly according to any one of claims 1 to 14, substantially as hereinbefore described, and/or as shown in the accompanying drawings.

36. A stairlift assembly according to any one of claims 15 to 18, substantially as hereinbefore described and/or as shown in the accompanying drawings.

37. A stairlift assembly according to any one of claims 19 to 27 substantially as hereinbefore described and/or as shown in the accompanying drawings.

38. A method of connecting together two sections of extruded material according to claim 28 or claim 29, substantially as hereinbefore described and/or as shown in the accompanying drawings.

39. A stairlift assembly according to any one of claims 30 to 32, substantially as hereinbefore described and/or as shown in the accompanying drawings.

40. Any novel feature or novel combination of features described herein and/or in the accompanying drawings.

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Application No: GB 0019562.8 24 **Examiner:** Trevor Berry
Claims searched: 1 to 14 **Date of search:** 5 February 2002

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.T): B8L (LB)

Int Cl (Ed.7): B66B

Other: ONLINE: EPODOC, JAPIO, WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
A	GB 2137589 A	STOPHER-note page 3 lines 35-42	
A	US 5230405	BARTELT-note column 5 lines 29-45	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
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